Table 1. Summary Evaluation of BDCP Conservation Element Bundles by Covered Fish Species

Effects Categories B-L● = low beneficial effects at population level A-L○ = low adverse effect at population level □ C-L = low level of certainty regarding assessment of bundle outcomes □ C-M = moderate level of certainty regarding assessment of bundle outcomes □ C-M = moderate level of certainty regarding assessment of bundle outcomes □ C-H = high level of certainty regarding assessment of bundle outcomes □ C-H = high level of certainty regarding assessment of bundle outcomes □ C-H = high level of certainty regarding assessment of bundle outcomes □ C-H = high level of certainty regarding assessment of bundle outcomes □ C-H = high level of certainty regarding assessment of bundle outcomes

Conservation Element Bundles	COVERED FISH SPECIES									
	Smelt	Sturgeon	Salmonids	Sacramento Splittail						
	Effect Certainty	Effect Certainty	Effect Certainty	Effect Certainty						
Water Operations and Con	veyance Bundles									
1. Real-time operation of CVP/SWP	B-L ●	NE □□□ C-H	B-L ● □□□ C-H	B-L ● □□□ C-H						
	Low benefit associated with reduction in entrainment loss	Negligible benefit associated with reduction in entrainment loss, but because relatively few sturgeon are entrained, the level of population benefit would be minimal	 Low benefit to more common salmonids; moderate benefit to less common salmonids associated with reduction in entrainment loss; Benefits depend in part on frequency, magnitude, and duration of export reductions 	Low benefit associated with reduction in entrainment loss in most years						
2. Reduced demand/Delta diversions	B-M ●● □□ C-M	NE □ C-L	В-М ●● □□□ С-Н	В-М ●● □□□ С-Н						
	 Potential beneficial effects associated with reduced mortality from entrainment, improvements to water quality and flow conditions, increased food availability and quality, and improved ecosystem processes Benefits are dependent on the amount of reduction 	Largely unknown, but probably minimally positive	 Low benefits from improved water quality and flow conditions Moderate benefit to less common salmonids associated with reduction in entrainment loss; low benefit to more common salmonids Benefits are dependent on magnitude and seasonal timing of reduction 	Benefits through increased water quantity and quality, but minimized by high tolerance to environmental conditions						

Conservation Element Bundles	COVERED FISH SPECIES										
	Si	melt		Sturgeon		Salmonids	Sacramento Splittail				
	Effect	Certainty	Effect	Certainty	Effect	Certainty	Effect	Certainty			
3. Opportunistic exports	B-L •	$\Box\Box$ C-M ated with reduction in	B-M • •	$\Box\Box$ C-M ssociated with reduction in		□□ C-M nefit to less common		$\Box\Box$ C-M it from reduction in			
	 entrainment loss, leading the loss of the los	nydrologic conditions, d availability, food cosystem processes t associated with v of non-native	entrainment lo native predato • Low to moder altering flows	oss and reduction in non- ors rate benefit associated with to mimic historic hydrologic d improved spawning habitat	salmonids as entrainment of common salm. • Moderate being improved had entrainly his upstream flow improved was and ecosystem food supply, exporting occ. • Relative benefall-run than to interaction.	sociated with reduction in loss; low benefit to more monids nefits associated with bitat quantity igh benefit associated with w modifications causing ater quality, flow conditions, m processes, and increased but depends on time of year	entrainmer water quali competitor Moderate t increased s habitat qua	at from reduction in the mortality and improved ity, and reduced non-native is and predators benefit associated with pawning and juvenile rearing ality and quantity, increase ability, and ecosystem			
4. SDA facility	В-М ●●	□□ C-M	A-L O	□ C-L	B-M ●●	□□ С-Н	B-M ●●	□□□ С-Н			
	 reduced entrainment availability of habitin non-native command improved eccions. Moderate benefit a improved hydrody. Long period requirelative to species. Benefits are dependent conditions, hydraus. 	red to implement needs dent on the hydrologic lic residence time, time of year, location,	improved flow spawning and reduction in n • Potentially low	effect associated with v conditions, accessibility to juvenile rearing habitat, and on-native predators v to moderate adverse effect h false attraction flows	increased ent (performance unknown), by population Moderate ber non-native co increased foo availability High benefit flow modifica flows causing rearing habita	rerse effect associated with crainment from two intakes e of a new fish screen is ut low effect on overall mefit associated with reduced empetitors/predators and ed quality, quantity, and associated with upstream ations and more natural g improved water quality, at, and ecosystem processes igh adverse effect associated raction flows	entrainmer but low effe • Moderate t improved v conditions, food availa competitor ecosystem • Improved of	conditions not expected in a because low salinity must be			

Conservation Element Bundles	COVERED FISH SPECIES										
		Smelt	Sturge			Salmo				mento Splittail	
	Effect	Certainty	Effect	Certainty	Eff	ect	Certainty	Eff	ect		Certainty
5. Isolated facility	 High benefit ass elimination of en improvements t conditions, increand increased ed 	sociated with improved r, quality, and availability ociated with virtual ntrainment losses, to hydrodynamic eased food availability, cosystem processes uired to implement	 B-M • • Low benefit associated loss and reduction in reduction in reduction. Moderate benefits associated associated properties associated and juvenile rearing heart and quality. 	non-native predators ociated with access to spawning		Low benefit associatentrainment mortali High benefit associa	ty ted with improved conditions, increased of habitat and increased quantity, ility of food, and	•	Low benefit as entrainment m Moderate bene non-native con High benefit a water quality a increased habi	efit associated winpetitors and prossociated with in and flow condition tat and food quancessibility, and	ith reduced edators nproved ons, lity,
6. Bifurcated SDA facility	hydrologic cond diversity, compl availability • High benefits as food availability processes	c-L sociated with improved litions, increased habitat lexity, quality, and sociated with increased and improved ecosystem uired to implement es needs	 Low to moderate beneassociated with reduce improved flow condit access to spawning an habitat, and reduction predators Potentially low advers with false attraction flows 	ed mortality, ions to improve d juvenile rearing in non-native se effect associated	•	Low benefit associate entrainment mortalism. Moderate benefits a reductions of non-nacompetitors/predat. High benefits associated water quality and flequality and quantity habitat and migratic increased food quality availability, and improcesses	ssociated with ative ors ated with improved ow conditions, higher of juvenile rearing on corridors, ity, quantity, and proved ecosystem	•	Low adverse eincreased entra Low benefit as non-native con Moderate bene with improved High beneficia increased habi	effect associated vainment from two ssociated with recompetitors and properticial impact associated water quality all effects associated and food quality and evailability, and evailability.	ro intakes duction in edators sociated ed with lity,
7. Dual conveyance facility	 Low benefit asso water quality are increased habita Moderate impro- availability and Potentially high 	ecosystem processes adverse effect from not ted within a time frame	 A-L ○ Low benefit associated entrainment mortality use of IF vs. South Dereduction in non-native. Low to moderate benefit high fluctuating hydroimproved access to sprearing habitat, reduce food supply. Dredging would cause water quality. 	ta facilities, and repredators effect associated plogic conditions, awning and juvenile ed water quality and	•	Low benefit associate entrainment mortalice Moderate benefits as increased food qualicavailability, reduction competitors and prefits) High benefits associate water quality and floincreased quality and habitat and migration	ty ssociated with ity, quantity, and ons in non-native edators (but less than ated with improved	•	Low benefit as mortality from native mortali Low adverse e reduced flow or residence time quantity Moderate benefit	esociated with reconstruction entrainment and the entrainment and the effect associated with the effect as a second control of the effect associated with the effect as a second control of the effect as a sec	d non- ter quality with vater ced food

Conservation Element Bundles	COVERED FISH SPECIES											
		Smelt		Sturgeon		Salmo	nids	Sacramento Splittail				
	Effect	Certainty	Effect	Certaint	y Eff	fect	Certainty	Eff	ect (Certainty		
8. SJR corridor isolated	A-L O	□□ C-M	U	□ C-	L B-I	L •	□□□ С-Н	NE		□□ C-H		
 Low adverse effect associated with increased entrainment, reduced hydrologic residence times, and reduced ecosystem processes Low benefit associated with food availability Potentially high adverse effect from not being implemented within a time frame 			Not enough known about sturgeon to evaluate effects, but possible increase in entrainment and decrease in habitat quality and food quantity			Low benefit associated with increased food quantity and improve conditions for salmonids emigrating from San Joaquin River system			 Low adverse effects associated with reduced habitat quality and food production from reduced water residence time Low benefit associated with reduced mortality from entrainment Moderate benefit associated with increased food supply 			
Entrainment and Predation	needed for the	*										
9. Minimize SWP/CVP mortality	NE NE	□□ С-М	U	□ C-	L NE	Ξ	□□□ С-Н	NE		□□ С-Н		
	Low benefit associated with reduced mortality from entrainment		 Not enough known about sturgeon to evaluate effects, but possible decrease in 			Low benefit from renon-natives in CCF	duced predation by	Low benefit associated with reduced mortality from entrainment				
		ffect associated with lity of non-natives	entrainm	ent	•	Low adverse effect a reduction in non-na			Low adverse effect of reduced mo of non-natives	ortality		
10. Minimize non- SWP/CVP entrainment	B-L ●	□□ C-M	B-L ●	□□ C-N	1 NE		□□□ С-Н	NE		□□ С-Н		
	mortality from food quality an improved ecos • Moderate bene improved hydrometric mortality from food and food improved hydrometric mortality from food food food food food food food fo	entrainment, increased and availability, and ystem processes efit associated with rodynamic conditions and f diversions are removed	VIOLENCE VI	efit associated with reduced r from entrainment	•	Likely minimal benereduced entrainment Low adverse effect of of non-native predat	t of reduced mortality	•	Low benefit associated with redu- mortality from entrainment Low adverse effect of reduced mo of non-native predators/competit	ortality		
	Antonia	ffect associated with ative mortality from										
11. Improve habitat to reduce predation	B-L ●	□ C-L	U	□ C-	L B-1	L •	□□ С-М	B-N	M ●●	□□ С-Н		
	mortality from	sociated with reduced predation by non-natives, and hydrologic conditions	evaluate	igh known about sturgeon to effects, but possible marginal y reducing predator abundance	•	Low benefit associate predation by non-nate quantity and quality amount of improver	ntives, higher habitat v, but dependent on	•	Marginal benefit associated with increased shallow water habitat Moderate beneficial effect associa reduced predation			

Conservation Element Bundles	COVERED FISH SPECIES									
	Smelt	Sturgeon	Salmonids	Sacramento Splittail						
	Effect Certa	ainty Effect Certaint	y Effect Certainty	Effect Certainty						
12. Isolate gravel pits	NE □□□	C-H NE	H B-L ● □□ C-M	B-L ● □□□ C-H						
	Outside of species habitat	Ongoing sampling indicates captured gravel pits are not a stressor on green or white sturgeon	 Low benefits associated with reduced predation by non-natives Benefits will be greatest on San Joaquin, where majority of gravel pits are located 	Low benefit associated with reduced predation by non-natives and marginal increase in shallow habitat						
13. Install screens on upstream diversions	NE □□□	C-H NE	M NE □□ C-M	NE □□□ C-H						
	Outside of species habitat	Negligible benefit associated with reduced entrainment loss	Negligible benefit associated with reduced entrainment loss, but expected to be minimal	Positive effects of reduced entrainment would be cancelled out by adverse effects of reduced entrainment of predators and competitors						
Flow-Related Habitat Impr	ovement Bundles									
14. Operate DCC to improve passage	NE \Box	C-M NE	M NE	B-L ● □□□ C-H						
	e e	 Marginal benefit associated with reduced non-native predator habitat, but expected to be negligible DCC gates are currently open during juvenile outmigration period, so no additional benefit Gates are already operated to minimize outmigrating salmonid mortality; therefore, effects are minimal 								
15. Open DCC & install screens at DCC & Georgiana Slough	NE □□	C-M A-L O	M B-M ● ● □□ C-M	A-L ○ □□□ C-H						
	Potential marginal benefit associated verbuced non-native predator habitat	Low to moderate adverse effects associated with reduced access to food and habitat in the interior Delta		 Low adverse effects associated with reduced water quality, flow conditions and increased toxics Negligible adverse effect associated with reduced access to food in interior Delta 						
16. Re-operate upstream storage facilities	NE 🗆	C-M B-M ●● □□ C-N	M B-M ● ● □□ C-M	В-Н ●●●						
	Outside of species habitat	Moderate positive effect associated with increased water quality, creation of attraction flows, barrier passage flow, and improved habitat quality and quantity	 Moderate benefit associated with increased water quality and flow conditions, increased habitat quantity, and ecosystem processes Potentially low to moderate benefit associated with increased food quality and reduced non-native species 	 Low positive effects associated with increased food quality and quantity and reduction of non-native competitors and predators Moderate positive effects associated with increase water quality and flow conditions High positive effects associated with increased accessibility to spawning habitat and improved ecosystem processes 						

Conservation Element Bundles			COVERED FI	SH SPECIES				
	Smelt		Sturgeon	Salmonids	Sacra	mento Splittail		
	Effect Certa	inty Effect	Certainty	Effect	Certainty	Effect	Certainty	
17. Improve and create bypass and floodway habitat	NE 🗆 🗆	С-М В-М ●●	□□ С-М	В-М ●●	□□□ С-Н	В-Н ●●●	□□□ С-Н	
	Outside of species habitat	reduc impr avail	to moderate benefits associated with ctions in non-natural mortality, oved water quality, improved ability of habitat, and improved food ty and quantity	reduced abo competitors habitat qua	venefits associated with undance of non-natives is and predators, increased ntity, increased food quality ty, and improved ecosystem	habitat quality	nssociated with food and , quantity, and nd improved ecosystem	
Physical Habitat Restoration	on Bundles	<u> </u>				•		
18. Restore habitat in the north, east, and west Delta	B-H ●●●	C-L B-H ●●	□□ С-М	B-L ●	□□ С-М	В-Н ●●●	□□□ С-Н	
 Low benefit associated with improved water quality and hydrologic conditions High benefit associated with improved habitat quality, availability, and complexity, and ecosystem processes Potential high benefit associated with increased food availability, but largely unknown 		ns incre avail	Moderate to high benefits associated with increased quantity, quality, quantity, and availability of habitat and food		ts from reduced mortality atives, increased food nproved habitat quality and nd improved ecosystem	 Low benefits associated with reductions of non-natives Moderate benefits associated with improved water quality High benefits associated with increased quality, quantity, and accessibility in habitat and food and improved ecosyster processes 		
19. Restore habitat in the central Delta	В-Н ●●●	C-L B-M ●●	□□ С-М	B-L ●	□□ С-М	B-M ●●	□□□ С-Н	
	Similar to but lower benefits than #18 #21 because central Delta has lower va to smelt than north Delta and Suisun Marsh, but greater than #20 because central Delta has higher value to smelt than south Delta	llue incre avail	erate to high benefits associated with ased quantity, quality, quantity, and ability of habitat and food		nilar to #18, but lower because onids pass through central		ower benefits than #18 or area and less desirable ttail	
20. Restore habitat in the south Delta	B-M ● ●	C-L B-L ●	□ C-L	B-L ●	□□ С-М	B-M ● ●	□□□ С-Н	
	• Similar to but lower benefits than #18, #19, #21 because south Delta has lowe value to smelt than north Delta, centra Delta, and Suisun Marsh	r becau	ar to but lower benefits than #18 & 19 use sturgeon enter Delta from the		nilar to #18, but lower because ead and fall-run salmonids are uin River		ower benefits than #18 or area and less desirable ttail	

Conservation Element Bundles	COVERED FISH SPECIES								
		Smelt		Sturgeon	A	Salmonids	!	Sacramento Splittail	
	Effect	Certainty	Effect	Certainty	Effect	Certainty	Effect	Certainty	
21. Restore Suisun Marsh habitat	B-H ● ●	□ C-L	B-L ●	□ C-L	B-L ●	□□□ С-Н	B-H ● ●	□□ С-М	
	#19 & #21 becau	to #18, but greater than use Suisun Marsh has smelt than south and	water quality,	ssociated with improved flow conditions and tat availability, increased ty	from no quantity	nefits from reduced mortality on-natives, increased food y, improved habitat quality and y, and improved ecosystem es	reduced in predators Moderate reduced in and flow High bein habitat questions	eficial effects associated with non-native competitors and see benefits associated with mortality, increase water quality conditions aefit associated with increased uantity, quality, and availability iles and adults	
22. Restore habitat upstream of Delta	NE	□□ С-М	В-М●●	□□ С-М	В-Н ●●●	□□□ С-Н	B-H ●●	□□□ С-Н	
	Outside of species habitat		improved wateModerate bene improved acce	ate benefits associated with er quality, efits associated with ess to and quantity of itat, increased food supply	mortalit improvi increase accessib	enefits associated with reduced ty from non-native predators, ing hydrologic conditions, ed quantity, quality, and bility of habitat, increased food improved ecological processes		nefits specifically from floodplain on (similar to #17)	